ENPHASE.

TECHNICAL BRIEF

Enphase Energy System planning with IQ Battery 10C/10CS and IQ Combiner 6C

Applicable regions: North America

Contents

1. About this guide

This document contains information for site surveyors and design engineers to analyze a site and plan the design, installation, and support of home energy backup systems using the fourth-generation Enphase Energy System consisting of IQ Battery 10C/10CS, IQ Combiner 6C, IQ Meter Collar, and IQ Microinverters. This is not a guide for installation and operation. This document supplements the information in the data sheets, quick install guides, and product manuals. The diagrams and information in this document illustrate system configurations and installations. They may not, however, include all state and local codes, standards, and other requirements from Authorities Having Jurisdiction (AHJs) applicable to a site.

NOTE: Unless otherwise noted, "Enphase Energy System" refers to its fourth generation throughout this document.

Related documents

- IQ Battery 10C quick install guide
- IQ Combiner 6C quick install guide
- IQ Meter Collar quick install guide
- Compatibility matrix
- PCS integration in 4th-generation Enphase Energy Systems
- Enphase Energy System with IQ Battery 10C Owner's guide
- Concept of operations: Fourth generation Enphase Energy System with IQ Meter Collar

2. Enphase Energy System overview

An Enphase Energy System falls into one of the following groups depending on the energy sources used.

- Solar Only
- Battery Only
- Solar + Battery

The system can also be divided into grid-tied and grid-forming systems based on its ability to form a microgrid. A grid-forming system must have an IQ Meter Collar and IQ Battery 10C/10CS installed.

Grid-forming systems can be categorized as whole home or partial home backup systems.

Whole home backup: When the power grid fails, the Enphase Energy System switches all electrical circuits to backup power. The system must have sufficient backup power and energy capacity to support all the loads in a home.

Partial home backup (planned configuration, currently not supported): The home loads are segregated into backup and non-backup loads. A backup load panel is set up to power backup loads. During a grid outage, the Enphase Energy System powers the backup load panel while leaving the main load panel unpowered.

NOTE: Whole-home backup with load control, using the integrated load controller in the IQ Combiner 6C, is now supported.

2.1 Product overview

IQ8 Series Microinverters and accessories: The Enphase Energy System is fully compatible with IQ8 Series Microinverters.

IQ6/IQ7 Series Microinverters and accessories: The Enphase Energy System is fully compatible with IQ7 and IQ6 Series Microinverters. Retrofit upgrades are as simple as new installations.

WARNING:

- IQ8 Series Microinverters are not backward compatible with IQ6 or M Series Microinverters.
- Enphase Energy System does not support mixing IQ6 Series Microinverters with IQ8 Series Microinverters or M Series Microinverters.

IMPORTANT: IQ8 Series Microinverters can be added to existing IQ7 systems using the same IQ Gateway in the following grid-tied configurations only:

- Solar Only
- Solar + Battery without backup

A mixed system of IQ7 and IQ8 will not support IQ8-specific PCS features.

IMPORTANT:

- IQ7 Series Microinverters cannot be added to a site with existing IQ8 Series Microinverters using the same gateway.
- A mixed system of IQ7 and IQ8 Series Microinverters will not support IQ8-specific PCS features and grid-forming capabilities.
- If IQ7 Microinverters need to be added to a site using the same gateway where IQ8 Microinverters are present, the IQ8 Microinverters must be retired and recommissioned after commissioning the IQ7 Microinverters.

IMPORTANT: M Series Microinverters or other legacy microinverters are incompatible with IQ Combiner 6C.

The **IQ Battery 10C/10CS** all-in-one AC-coupled system is compact, powerful, reliable, and safe. It has a total usable capacity of 10.0 kWh. Each IQ Battery 10C/10CS includes four grid-forming microinverters with a 7.08 kVA continuous power rating. When installed with an IQ Meter Collar, the IQ Battery 10C/10CS can provide backup capability, and installers can design the right system size to meet the customer's needs. Each system can support up to eight IQ Battery 10C/10CS, providing up to 30.72 kW of power and 80 kWh of energy storage.

The IQ Battery 10C and IQ Battery 10CS are two variants of the same battery. The only difference lies in the **type of cover** that comes with each.

- **IQ Battery 10C**: Includes a cover that supports **dual stacking** of the 5 kWh battery modules.
- **IQ Battery 10CS**: Includes a cover designed for **vertical or horizontal stacking** of the 5 kWh battery modules.

NOTE: The **IQ Battery 10CS** will be **available in the future**.

IQ Combiner 6C is an all-in-one solution that integrates breaker spaces for PV (3 × 20 A + 1 × 20-20 A quad breaker), battery (2 × 80 A), and EV charger (1 × 60 A). It includes factory-installed Current Transformers (CTs) for monitoring PV and battery current. It also has an option to add CT for the IQ EV Charger. The IQ Combiner 6C is rated for an output of 100 A continuous current to the main panel

(125 A breaker). The Combiner 6C is designed for field serviceability, allowing field replacement of the IQ Gateway and Combiner Controller boards. An integrated load controller supports load and PV circuit monitoring and control. It helps avoid upsizing the system cost if NEC 2023 702.4 (A) or 710.15 (A) requires a larger system size. The integrated load controller supports up to 1 × 80 A BR form factor, double-pole breaker, or quad breakers with max. 80 A per phase. The load controller includes integrated hold-down functionality for the breaker and comes equipped with current transformers (CTs) for monitoring load consumption.

Ride Through Power supply board (RT-PSB) is an optional accessory. RT-PSB is typically not required and is needed only when all the following conditions are met:

- The system is solar only.
- The utility mandates the IEEE 2030.5 connection via an Ethernet connection to the IQ Gateway.
- The utility mandates that the above connection must be sustained during a low-voltage ride-through event of ≤0.5 p.u. for 1 second.

NOTE: IQ Gateway and Mobile Connect cellular modem are integrated into the IQ Combiner 6C.

NOTE: Stand-alone IQ Gateway integration is not supported with IQ Battery 10C/10CS.

2.2 Interoperability with other product generations

- IQ Battery 10C/10CS works only with IQ Combiner 6C. It does not work with IQ Gateway or Envoy S Metered.
- IQ Battery 10C/10CS and IQ Combiner 6C do not work with any variants of the IQ System Controller.
- IQ Battery 10C/10CS and IQ Combiner 6C are not compatible with IQ Battery 3T, IQ Battery 10T, or IQ Battery 5P or with earlier IQ Combiners. Compatibility with IQ Battery 5P will be available in the future.
- IQ Combiner 6C supports direct integration of IQ Series Microinverters.
- IQ Combiner 6C does not support legacy Enphase microinverters or third-party inverters at the time of product launch. These will be supported in the future.

3. Design an Enphase Energy System

To learn about designing an Enphase Energy System, see the following topics.

3.1 National Electrical Code

The National Electric Code Article 705 Part II allows a microgrid system to disconnect from the utility grid and operate in island mode, forming an intentional island, or in other words, a microgrid that supplies backup power. The ability of an inverter to transition between interactive and island modes is called multi-mode operation. A system capable of islanding requires a microgrid interconnect device (MID) to island the home from the utility grid.

The MID in IQ Meter Collar allows the IQ Battery 10C/10CS to establish an intentional island or operate in island mode when disconnected from the area's electric power.

The following figure shows a drawing of an AC-coupled multi-mode system based on 2020 NEC sections 690 and 705. For more information, see Rapid shutdown initiator and disconnect locations on page 23.

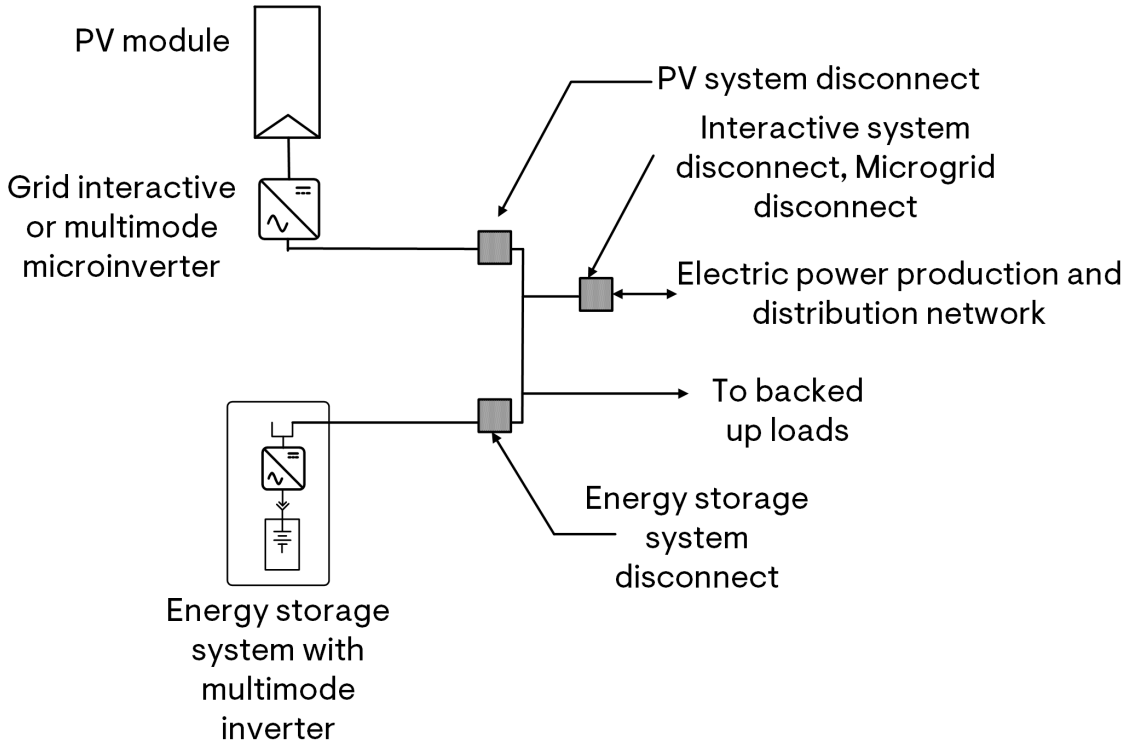

Figure 1: AC-coupled multi-mode system

3.2 Power Control Systems (PCS)

Power Control Systems (PCS), as defined in NFPA 70, NEC 2020 705.13, control the output of one or more power production sources, energy storage systems (EES), and other equipment. PCS limits the current flowing in the busbars and conductors supplied by the power production sources and/or energy storage systems.

Enphase Energy Systems have electric power production sources such as microinverters and/or IQ Batteries interconnected in parallel. The amount of power production sources that can be connected to a system is generally governed by various sections of the NEC. PCS allows you to install more batteries in the Enphase Energy System. It also provides features to adhere to special compliance requirements in certain jurisdictions.

PCS enables the following features in the Enphase Energy System:

- IQ Battery oversubscription mode: It increases the energy storage capacity that can be installed for a given battery breaker rating by reducing the maximum continuous current rating of the battery to comply with 2020 NEC 705.28. Battery oversubscription can increase the energy capacity of the battery array by up to 200%; that is, up to four IQ Battery 10C/10CS units can be connected to an 80 A breaker on IQ Combiner 6C.

The overload capacity of an IQ Battery 10C/10CS remains the same, regardless of whether battery oversubscription is enabled. Battery oversubscription increases overload capacity relative to the new continuous current rating and is coordinated with circuit breaker trip curves.

Table 1: Overload current rating of one IQ Battery 10C/10CS

Overload current (Amperes)	Time (seconds)
56 A	3
44.8 A	5

- Battery import-only mode[1]: This feature ensures that the IQ Battery never exports power to the grid but can import from the grid.
- Battery export-only mode: The battery export-only feature ensures that the IQ Battery never imports any power from the grid but can export to the grid.

  NOTE: IQ Battery can operate either in battery import-only mode or battery export-only mode.
- Main panel upgrade (MPU) avoidance
  - The MPU avoidance feature can be configured using the following three options:
    - Using Busbar Overload Control
    - With Feeder Control (using the NEC 120% rule)
    - With Feeder Control (using the Current Limit Directly Entered)
  - MPU avoidance with Busbar Overload Control: Allows maximum renewable energy generation and helps avoid the cost of panel upgrade for large PV and battery systems under National Electric Code (NEC) 2020 705.13, reducing the system payback period. This is supported only if the system has IQ8 Series Microinverters.
  - MPU avoidance with Feeder Control: Enables avoiding the cost of a panel upgrade for large PV and battery systems by controlling the backfeed current into the main panel according to the National Electric Code (NEC) 2020 705.12. The feature ensures that the backfeed current allowed into the main panel is limited as per the configuration provided by the installer for both grid-tied and grid-forming configurations.
- Aggregate power export limit (PEL) mode[1]: This PCS feature ensures that the aggregate PV power exported to the grid is limited to the aggregate power export limit (PEL) value set by the installer. This limits the aggregate power export below the defined level, as measured at the Consumption CTs.

  NOTE: Only IQ8 Series Microinverters support the Aggregate power export limit mode and MPU avoidance with Busbar Overload Control.
- NEM integrity mode[1]: This is a PCS mode in which the PV and energy storage system (ESS) are evaluated for their ability to limit the export levels of a PCS-controlled PV/ ESS system to the grid, when operated in the presence of an uncontrolled PV/ESS legacy system. In this mode, the PCS-controlled PV and ESS's output power is controlled such that the instantaneous power exported by the combined system does not exceed the power generated by the legacy system.

For more information, see PCS integration in 4th-generation Enphase Energy Systems.

[1] Not available at launch

4. Economic use cases

The Enphase Energy System supports many economic goals. These include reducing utility bills by charging the batteries during low-tariff periods and saving energy to ensure that loads can be served through the batteries during high-tariff periods. Power from PV can be exported to the grid, especially during peak tariff periods.

Optimizing energy storage capacity and system sizing for economic use cases is beyond the scope of this document.

5. System profiles

The Enphase Energy System supports three smart battery profiles: Full Backup, Self-Consumption, and AI Optimization/Savings Mode.

- Full Backup: 100% of the battery capacity is reserved for backup, and the battery does not discharge while the system is connected to the grid. This profile is not available in grid-tied configurations.
- Self-Consumption: To ensure the home loads are served with PV and storage to the extent possible, the battery discharges until its reserved capacity. Effectively, the system minimizes grid imports. The battery discharges until the reserve charge limit is reached while on the grid and below the reserve charge limit when the grid is down. This profile is not available in battery-only systems.
- AI Optimization/Savings Mode: This profile is for the economic use case wherein the battery discharges at peak tariffs and charges using PV during low tariff periods.

NOTE: AI optimization is available only in a restricted number of states today. These states usually have export/import rates that vary by time, month, or on a dynamic day-to-day basis.

NOTE: The battery discharges up to the reserve charge limit while on the grid and below the reserve charge limit when the grid is down.

A description of these modes with screenshots of how homeowners can select the same is available in the Enphase Energy System with IQ Battery 10C Owner's guide.

NOTE: In all modes, the battery charges from the grid until the reserve charge limit to ensure that the desired amount of battery charge for backup is guaranteed to be available.

6. System sizing

6.1 Grid-tied systems

For grid-tied systems, optimal system sizing is a financial decision driven by factors such as solar irradiance at the location, energy usage patterns, and energy tariffs. Enphase recommends using the Solargraf tool to model and size the system appropriately.

6.2 Grid-forming systems

For grid-forming systems, additional analysis is required to align system capabilities with customer expectations, particularly regarding backup duration, the ability to support high-demand appliances like HVAC systems, and overall system resilience.

6.2.1 Load analysis

A proper load analysis is the first step in effectively sizing a system. If an IQ Gateway with properly configured Consumption CTs is already installed at a site, Enphase Cloud data can be used to size the system properly. Load data for system size can also be obtained through a site survey, utility bills, and third-party consumption meters.

6.2.2 Storage system sizing

1. Identify the largest single load power rating (kW) you want to back up and select the minimum IQ Battery 10C/10CS units required to meet the 2020 NEC 710.15(A) requirements.
2. Based on the estimated backup loads for the user-defined period, calculate the required energy storage (kWh) capacity and the minimum IQ Battery 10C/10CS units needed.
3. Based on a site's load analysis of both power (kW) and energy capacity (kWh) needed, determine the total number of IQ Battery 10C/10CS units required for the storage system.
4. The minimum IQ Battery 10C/10CS units required is calculated as the largest of steps 1 and 2.
5. The desired number of IQ Battery 10C/10CS units is the value calculated in step 3.

NOTE: The integrated load controller in IQ Combiner 6C can control the backup load circuits that exceed the storage power capacity.

6.2.3 System sizing

- The internal busbar in IQ Combiner 6C is rated for 200 A.
- If the system uses IQ6 or IQ7 Series Microinverters, the maximum PV array size allowed is 150% × (Rated kVA of the battery array).
- If the system uses IQ8 Series Microinverters, the maximum PV array size allowed is 200% × (Rated kVA of the battery array).

Table 2: PV to Battery ratio for IQ Series Microinverters

Number of IQ Battery 10C	Battery rated kWh	Battery rated kVA	Max. allowed IQ6/IQ7 Series PV kVA	Max. allowed IQ8 Series PV kVA
1	10	7.08	10.62	14.16
2	20	14.16	19.2	19.2
3	30	21.24	19.2	19.2
4	40	28.32	19.2	19.2
5[2]	50	30.72	19.2	19.2

[2] With IQ Battery oversubscription.

Number of IQ Battery 10C	Battery rated kWh	Battery rated kVA	Max. allowed IQ6/IQ7 Series PV kVA	Max. allowed IQ8 Series PV kVA
6[2]	60	30.72	19.2	19.2
7[2]	70	30.72	19.2	19.2
8[2]	80	30.72	19.2	19.2

7. Component list

Table 3: Component list for Solar Only or Battery Only system configurations

		Grid-tied			Grid-forming	
Component type	**Product name and model number**	**Solar Only**	**Battery Only**	**Solar + Battery**	**Battery Only**	**Solar + Battery**
Microinverters	IQ8 Series • IQ8-60-2-US • IQ8PLUS-72-2-US • IQ8M-72-2-US • IQ8A-72-2-US • IQ8H-240-72-2-US • IQ8MC-72-M-US • IQ8AC-72-M-US • IQ8HC-72-M-US	Up to 80 A continuous	—	Up to 80 A continuous	—	Up to 80 A continuous
	IQ8 Series • IQ8H-208-72-2-US	Up to 80 A continuous	—	Up to 80 A continuous	—	Up to 80 A continuous
	IQ7 Series • IQ7-60-2-US • IQ7PLUS-72-2-US • IQ7X-96-2-US • IQ7A-72-2-US	Up to 80 A continuous	—	Up to 80 A continuous	—	Up to 80 A continuous
	IQ6 Series • IQ6-60-2-US • IQ6PLUS-72-2-US	Up to 80 A continuous	—	Up to 80 A continuous	—	Up to 80 A continuous
Third-party PV/ Legacy Enphase PV[3]		Up to 64 A continuous	—	Up to 64 A continuous	Up to 64 A continuous	up to 64 A continuous

		Grid-tied			Grid-forming	
Component type	**Product name and model number**	**Solar Only**	**Battery Only**	**Solar + Battery**	**Battery Only**	**Solar + Battery**
Battery	IQ Battery 10C	—	Up to 8 units	Up to 8 units	Up to 8 units	Up to 8 units
	IQ Battery 10C Lifting Handle • B05CLH-0180-O	—	1	1	1	1
AC combiner	IQ Combiner 6C • X-IQ-AM1-240-6C	1	1	1	1	1
	Ride-through power supply X-IQ-NA-PSBECAP-R6	0 or 1, depending on whether the system must support IEEE 2030.5 for grid ride-through cases[4]	—	—	—	—
	Breakers Eaton BR2xx (20/30/40/60/80/100 A) GE/ABB THQL21xx (20/40/60/80/100 A) Siemens Q2xx (20/40/60/80/100A) Eaton BQC220220(20/20A), BQC220240 (20/40A)	As required	As required	As required	As required	As required
IQ Meter Collar	MC-200-011-V01	—	—	—	1	1
	Form 2S Meter pan	—	—	—	Needed for: • Utilities that do not approve the IQ Meter Collar being installed behind the utility meter.	

[3] Not supported at launch.
[4] The RT-PSB is needed only if all the following conditions are met: (i) The system is solar-only. (ii) The utility mandates the IEEE 2030.5 connection via an Ethernet connection to the IQ Gateway. (iii) The utility mandates that the above connection must be sustained during a low-voltage ride-through event ≤0.5 p.u. for 1 second.

		Grid-tied			Grid-forming	
Component type	**Product name and model number**	**Solar Only**	**Battery Only**	**Solar + Battery**	**Battery Only**	**Solar + Battery**
					• Supplies larger than 200 A. • Partial home backup.	
Current transformers	EVSE CT: CT-200-SPLIT or CT-200-CLAMP	0 or 1	0 or 1	0 or 1	0 or 1	0 or 1
	Consumption CT: CT-200-SPLIT CT-200-CLAMP	2	2	2	0 or 2[5]	0 or 2[5]
Control cable	CTRL-SC3-NA-01	—	As needed	As needed	As needed	As needed

8. Grid-tied (without backup) system configurations

Grid-connected systems can generate energy, supply it to home loads, and store it for later use if a battery is present—but only when the grid is available.

8.1 Grid-tied solar system

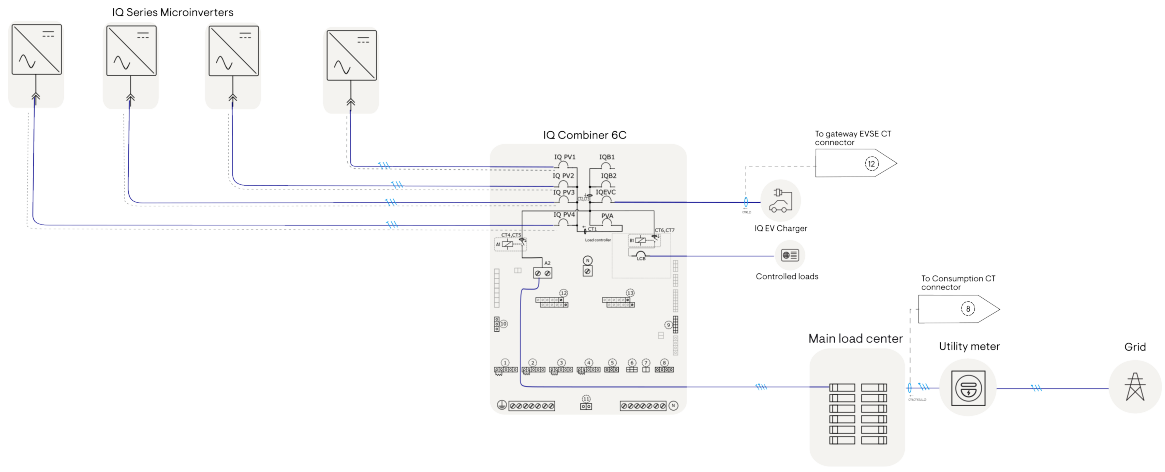

Figure 2: Solar grid-tied configuration with IQ8/IQ7/IQ6 Series Microinverters and IQ Combiner 6C

For notations, see Legend on page 31.

- The Ride Through Power supply board (RT-PSB, SKU: X-IQ-NA-PSBECAP-R6) is needed only when all the following conditions are met:

[5] Required for a partial home backup system.

  - The system is solar-only.
  - The utility mandates the IEEE 2030.5 connection via an Ethernet connection to the IQ Gateway.
  - The utility mandates that the above connection must be sustained for one second during a low-voltage ride-through event of 0.5 p.u.
- Disassemble the integrated load controller to make space for the ride-through power supply board. For more information, see the *IQ Combiner 6C quick install guide* .
- External Consumption CTs (L1, L2) must be installed for home energy monitoring.
- A 5th PV branch circuit can be accommodated by using a quad breaker in the IQ PV4 breaker slot.
- If an IQ EV Charger is connected to the IQ EV Charger breaker, its nameplate continuous current rating must be less than the combined continuous current rating of the IQ Battery circuits.

See Power Control Systems (PCS) on page 7 for details on supported PCS configurations.

8.2 Grid-tied solar and battery system

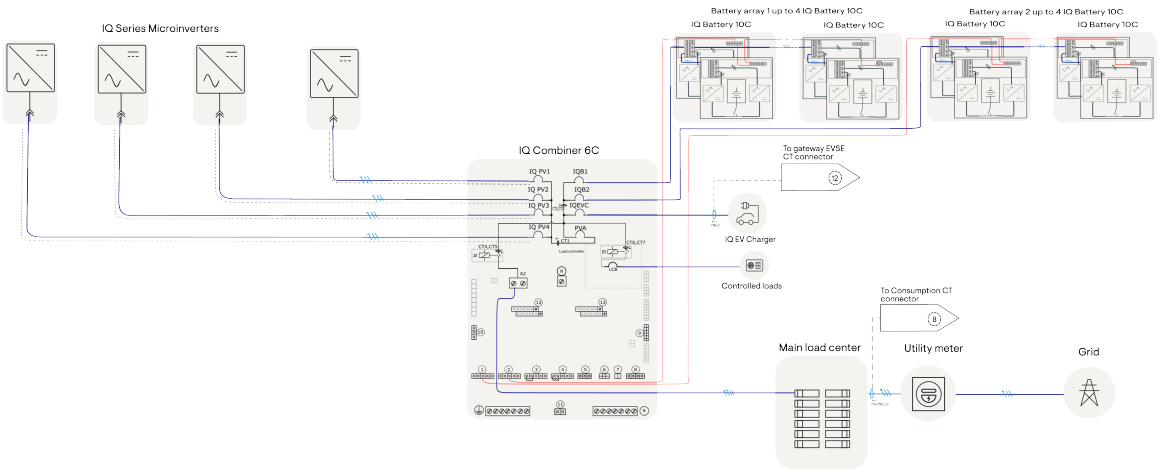

Figure 3: Solar and battery grid-tied configuration with IQ8 or IQ7/IQ6 Series Microinverters and IQ Combiner 6C

For notations, see Legend on page 31.

IMPORTANT: This system can be configured as a **backup ready** system. A backup-ready system is a grid-tied system that does not currently provide backup capability, but is designed to be easily upgraded to support backup functionality in the future. This configuration is useful in the following scenarios:

- The IQ Meter Collar is not fully approved by the utility.
- The IQ Meter Collar is approved, but the utility may take a long time to install it.

A backup-ready system includes the following components:

1. IQ Battery 10C/10CS and IQ Combiner 6C installed.
2. IQ Meter Collar present on-site (ready for utility installation under the utility meter), but not yet installed.
3. Consumption CTs wired to the IQ Combiner 6C to enable battery operation while grid-connected, maximizing homeowner savings.

- External Consumption CTs (L1, L2) must be installed for home energy monitoring.
- If an IQ EV Charger is connected to the IQ EV Charger breaker, its nameplate continuous current rating must be less than the combined continuous current rating of the IQ Battery circuits.

See Power Control Systems (PCS) on page 7 for details on supported PCS configurations.

8.3 Grid-tied battery-only system

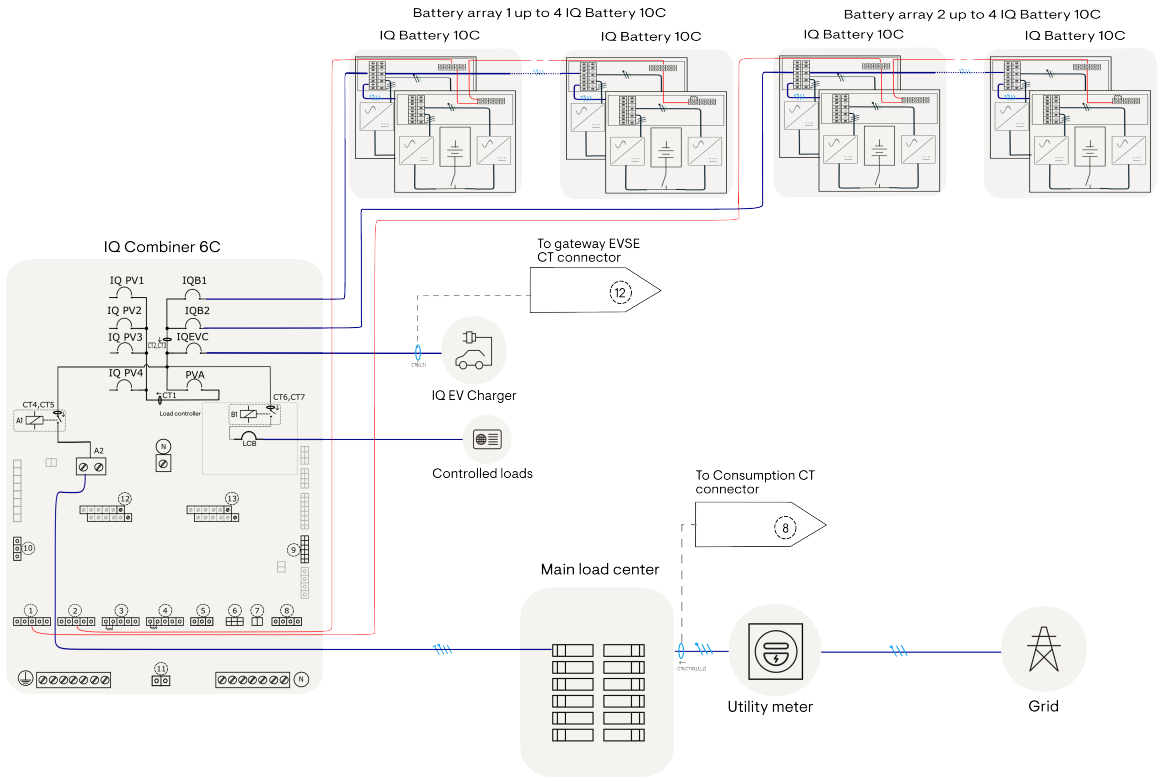

Figure 4: Grid-tied battery-only configuration

IMPORTANT: This system can be configured as a **backup ready** system. A backup-ready system is a grid-tied system that does not currently provide backup capability, but is designed to be easily upgraded to support backup functionality in the future. This configuration is useful in the following scenarios:

- The IQ Meter Collar is not fully approved by the utility.
- The IQ Meter Collar is approved, but the utility may take a long time to install it.

A backup-ready system includes the following components:

1. IQ Battery 10C/10CS and IQ Combiner 6C installed.
2. IQ Meter Collar present on-site (ready for utility installation under the utility meter), but not yet installed.
3. Consumption CTs wired to the IQ Combiner 6C to enable battery operation while grid-connected, maximizing homeowner savings.

For notations, see Legend on page 31.

- An external Consumption CT must be installed for home energy monitoring.
- If an IQ EV Charger is connected to the IQ EV Charger breaker, its nameplate continuous current rating must be less than the combined continuous current rating of the IQ Battery circuits.

See Power Control Systems (PCS) on page 7 for details on supported PCS configurations.

9. Grid-forming (with backup) system configurations

Grid-forming systems can generate energy, supply it to home loads, and store it in a battery for later use, even when the grid is unavailable.

9.1 Grid-forming solar and battery system

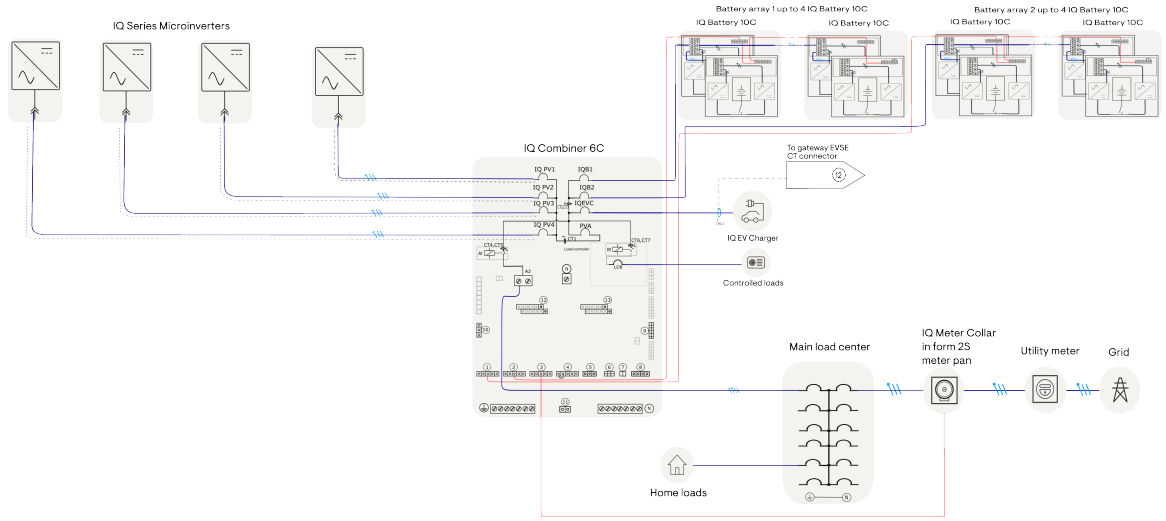

Figure 5: Grid-forming IQ8 or IQ7/IQ6 Series PV and battery system with IQ Meter Collar on a separate non-utility meter pan

For notations, see Legend on page 31.

IMPORTANT: This system can be configured as a **backup ready** system. A backup-ready system is a grid-tied system that does not currently provide backup capability, but is designed to be easily upgraded to support backup functionality in the future. This configuration is useful in the following scenarios:

- The IQ Meter Collar is not fully approved by the utility.
- The IQ Meter Collar is approved, but the utility may take a long time to install it.

A backup-ready system includes the following components:

1. IQ Battery 10C/10CS and IQ Combiner 6C installed.
2. IQ Meter Collar present on-site (ready for utility installation under the utility meter), but not yet installed.
3. Consumption CTs wired to the IQ Combiner 6C to enable battery operation while grid-connected, maximizing homeowner savings.

- The IQ Meter Collar works as a microgrid interconnect device (MID) to enable backup. The installation of the IQ Meter Collar enables full home monitoring.
- The IQ Combiner 6C includes an integrated load controller that can be used to control loads.
- If an IQ EV Charger is connected to the IQ EV Charger breaker, its nameplate continuous current rating must be less than the combined continuous current rating of the IQ Battery circuits.
- This configuration can vary based on the IQ Meter Collar approval or specific site-related constraints. For more information, see System variations based on IQ Meter Collar approval on page 19.

See Power Control Systems (PCS) on page 7 for details on supported PCS configurations.

9.2 Grid-forming solar and battery system with IQ Meter Collar under the utility meter

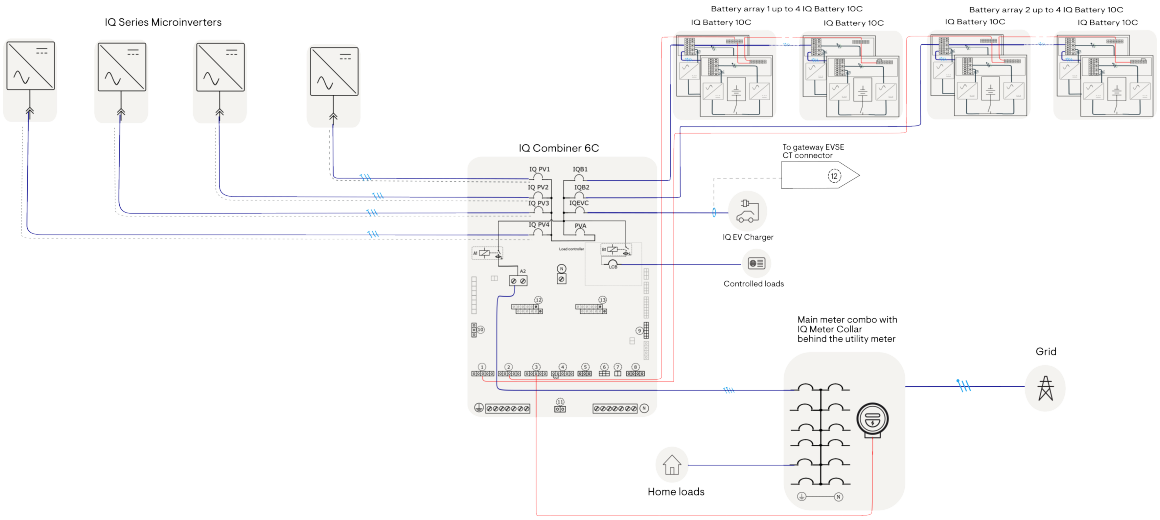

Figure 6: Grid-forming IQ8 or IQ7/IQ6 Series PV and battery system with IQ Meter Collar under the utility meter

For notations, see Legend on page 31.

IMPORTANT: This system can be configured as a **backup ready** system. A backup-ready system is a grid-tied system that does not currently provide backup capability, but is designed to be easily upgraded to support backup functionality in the future. This configuration is useful in the following scenarios:

- The IQ Meter Collar is not fully approved by the utility.
- The IQ Meter Collar is approved, but the utility may take a long time to install it.

A backup-ready system includes the following components:

1. IQ Battery 10C/10CS and IQ Combiner 6C installed.
2. IQ Meter Collar present on-site (ready for utility installation under the utility meter), but not yet installed.
3. Consumption CTs wired to the IQ Combiner 6C to enable battery operation while grid-connected, maximizing homeowner savings.

- The IQ Meter Collar works as a microgrid interconnect device (MID) to enable backup. The installation of the IQ Meter Collar enables full home monitoring.
- The configuration requires utility authorization to install the IQ Meter Collar behind the utility meter.
- The IQ Combiner 6C includes an integrated load controller that can be used to control loads.
- If an IQ EV Charger is connected to the IQ EV Charger breaker, its nameplate continuous current rating must be less than the combined continuous current rating of the IQ Battery circuits.
- This configuration can vary based on the IQ Meter Collar approval or specific site-related constraints. For more information, see System variations based on IQ Meter Collar approval on page 19.

See Power Control Systems (PCS) on page 7 for details on supported PCS configurations.

9.3 Grid-forming battery-only system

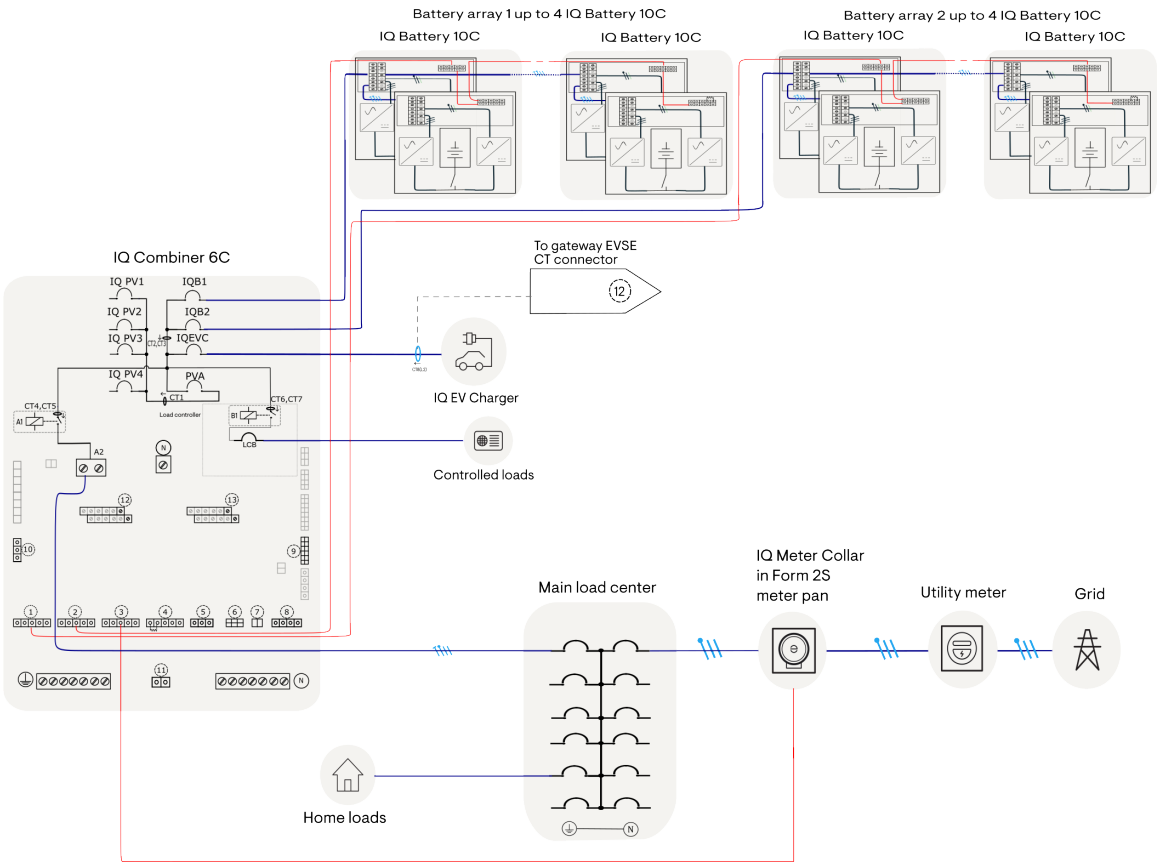

Figure 7: Grid-forming battery-only system with IQ Meter Collar in discrete meter pan

For notations, see Legend on page 31.

IMPORTANT: This system can be configured as a **backup ready** system. A backup-ready system is a grid-tied system that does not currently provide backup capability, but is designed to be easily upgraded to support backup functionality in the future. This configuration is useful in the following scenarios:

- The IQ Meter Collar is not fully approved by the utility.
- The IQ Meter Collar is approved, but the utility may take a long time to install it.

A backup-ready system includes the following components:

1. IQ Battery 10C/10CS and IQ Combiner 6C installed.
2. IQ Meter Collar present on-site (ready for utility installation under the utility meter), but not yet installed.
3. Consumption CTs wired to the IQ Combiner 6C to enable battery operation while grid-connected, maximizing homeowner savings.

- The IQ Meter Collar works as a microgrid interconnect device (MID) to enable backup. The installation of the IQ Meter Collar enables full home monitoring.
- The IQ Combiner 6C includes an integrated load controller that can be used to control loads.
- If an IQ EV Charger is connected to the IQ EV Charger breaker, its nameplate continuous current rating must be less than the combined continuous current rating of the IQ Battery circuits.

- This configuration can vary based on the IQ Meter Collar approval or specific site-related constraints. For more information, see System variations based on IQ Meter Collar approval on page 19.

See Power Control Systems (PCS) on page 7 for details on supported PCS configurations.

10. System variations based on IQ Meter Collar approval

This section covers the variations in system configuration based on IQ Meter Collar approval and site-specific constraints.

10.1 IQ Meter Collar approved by the utility

10.1.1 IQ Meter Collar installed in the main meter combo panel

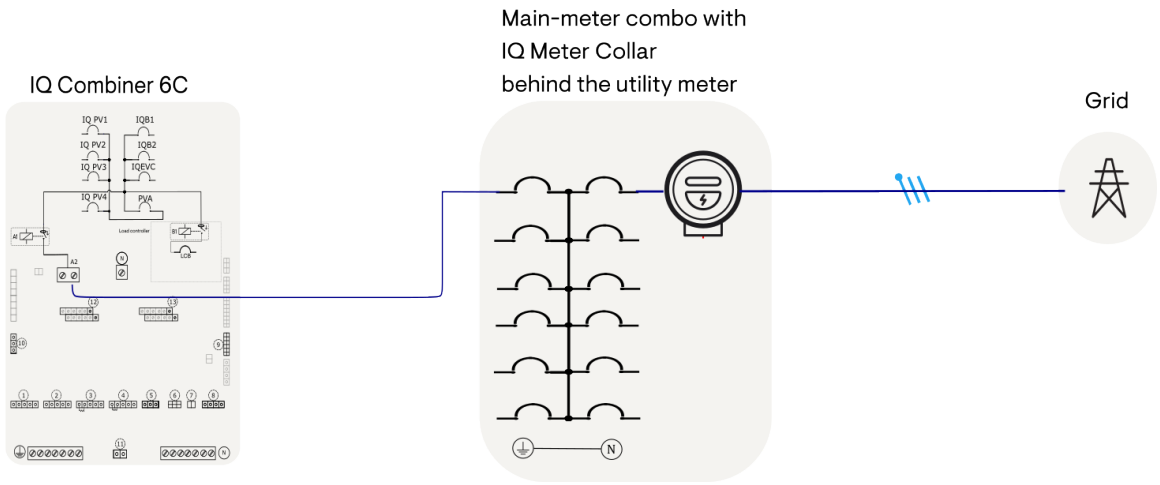

Figure 8: IQ Meter Collar installed in the main meter combo panel

For notations, see Legend on page 31.

- The configuration requires utility authorization to install the IQ Meter Collar behind the utility meter.
- The installation must meet all the site-level utility and AHJ requirements.
- See Grid-forming (with backup) system configurations on page 16 for details on other system components, features, limitations, etc.

10.1.2 IQ Meter Collar installed in Form 2S meter panel

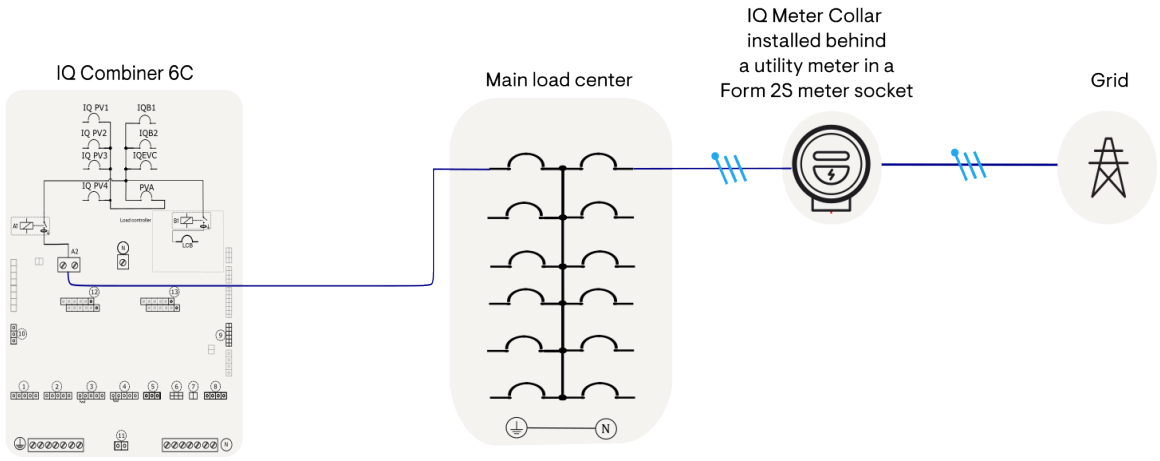

Figure 9: IQ Meter Collar installed in Form 2S meter panel

For notations, see Legend on page 31.

- The configuration requires utility authorization to install the IQ Meter Collar behind the utility meter.
- The installation must meet all the site-level utility and AHJ requirements.
- See Grid-forming (with backup) system configurations on page 16 for details on other system components, features, limitations, etc.

10.2 IQ Meter Collar not approved by utility

10.2.1 Supply side meter socket

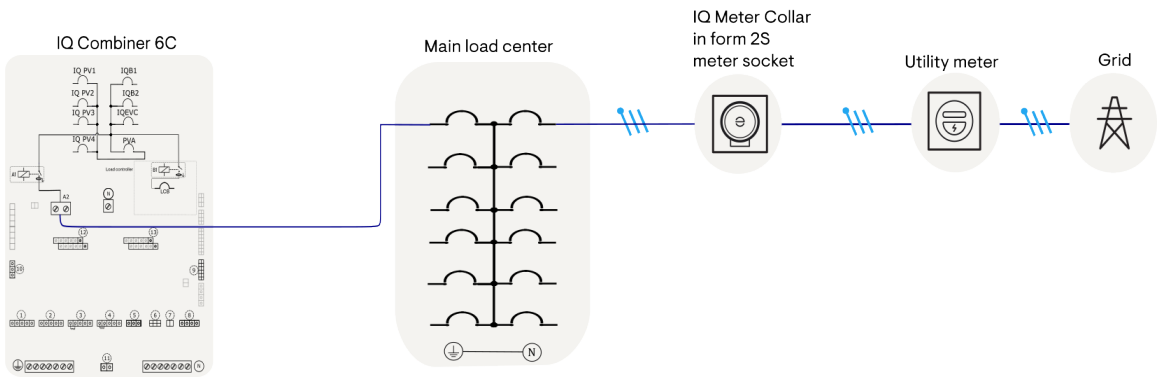

Figure 10: Supply side meter pan

For notations, see Legend on page 31.

- Refer to the Grid-forming (with backup) system configurations on page 16 for details on other system components, features, limitations, etc.

10.2.2 Load side meter socket

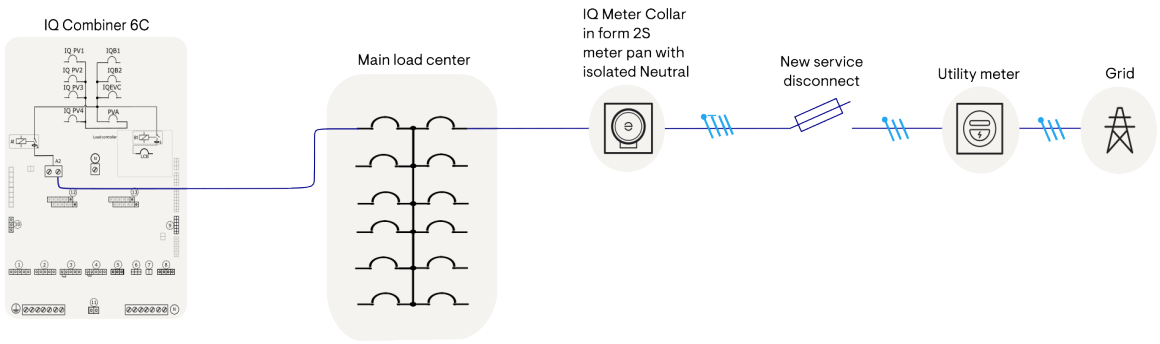

Figure 11: Load side meter pan

For notations, see Legend on page 31.

- Refer to the Grid-forming (with backup) system configurations on page 16 for details on other system components, features, limitations, etc.
- A panel with an isolated neutral and a ground connection to the panel chassis/body is required. Alternatively, if the neutral is passed through (i.e., not terminated on the panel), the ground must still be connected to the chassis/body.

11. Supported partial home backup configurations

This section covers the supported partial home backup for systems with 400 A supplies.

11.1 400 A supply configuration #1

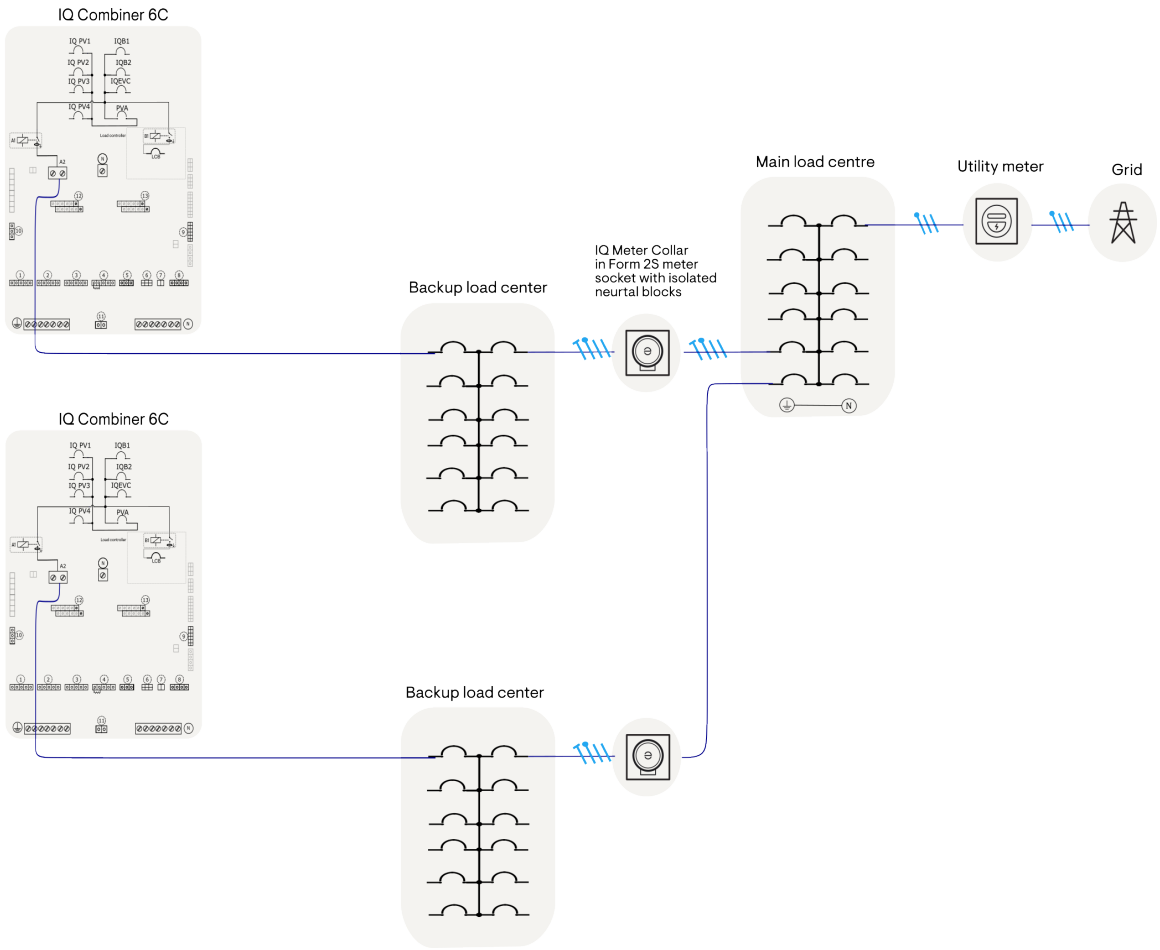

Figure 12: 400 A supply configuration #1: Two independent backup systems connected to the main load center in parallel

For notations, see Legend on page 31.

A panel with an isolated neutral and a ground connection to the panel chassis/body is required. Alternatively, if the neutral is passed through, that is, not terminated on the panel, the ground must still be connected to the chassis/body.

11.2 400 A supply configuration #2

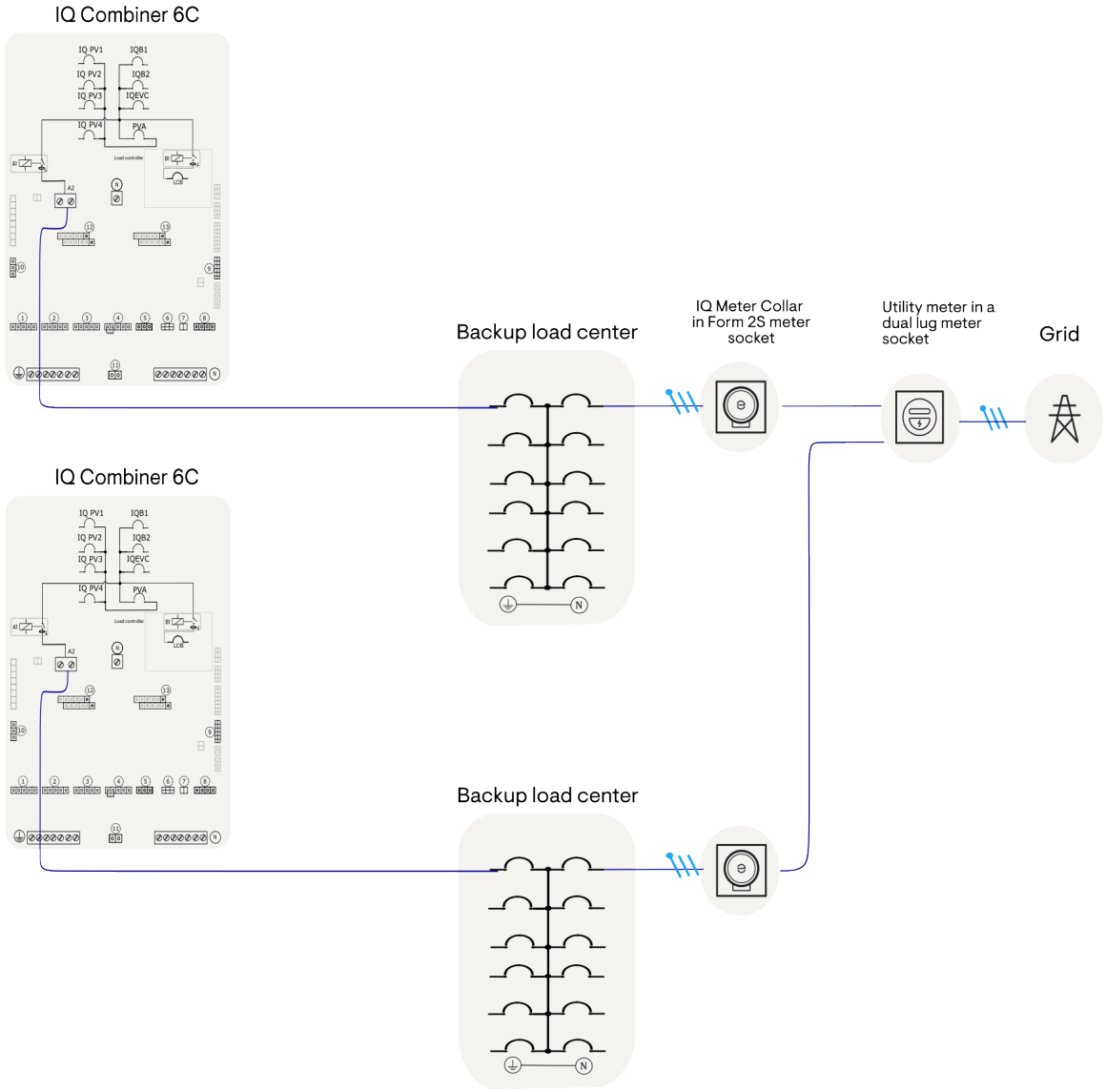

Figure 13: 400 A supply configuration #2: Two independent backup systems connected to double lug meter pan

For notations, see Legend on page 31.

12. Rapid shutdown initiator and disconnect locations

The rapid shutdown initiators and disconnects may vary depending on the location of the IQ Battery 10C, IQ Combiner 6C, and back-fed panel. The factory-installed PV aggregate 60 A breaker functions as a rapid shutdown initiator when the IQ Combiner 6C is installed at a readily accessible outdoor location. However, under NEC and local compliance requirements, the system can

meet rapid shutdown and disconnect requirements when an external device/disconnect is required for different scenarios.

Also, in certain situations, installing a visible-blade disconnect (safety disconnect) as a visible break for the DER system at the point of connection to the grid may be necessary.

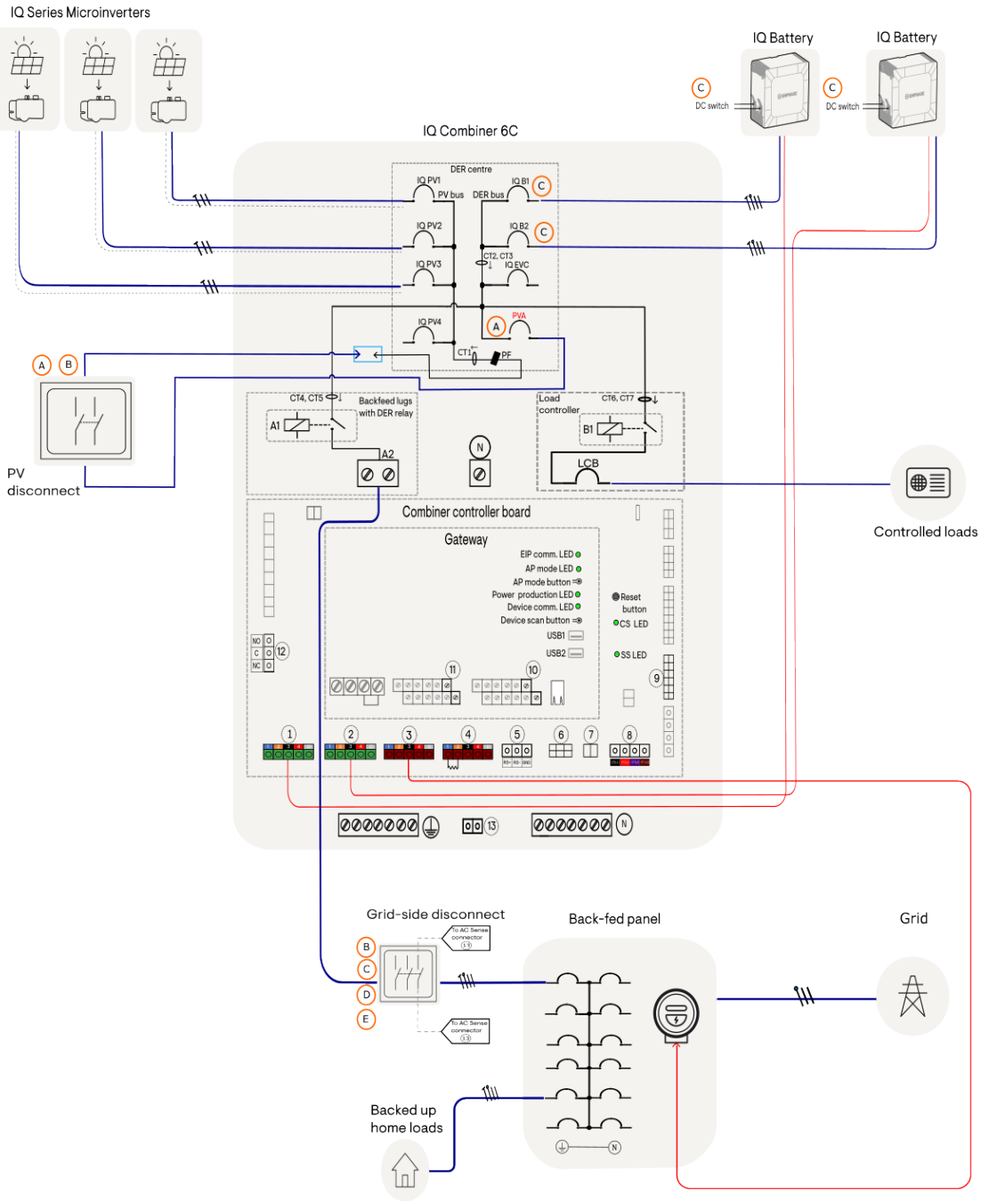

Figure 14: Grid-forming system initiators and disconnects

NOTE: PV disconnect in the figure above is inline with the PV Aggregate breaker in IQ Combiner 6C.

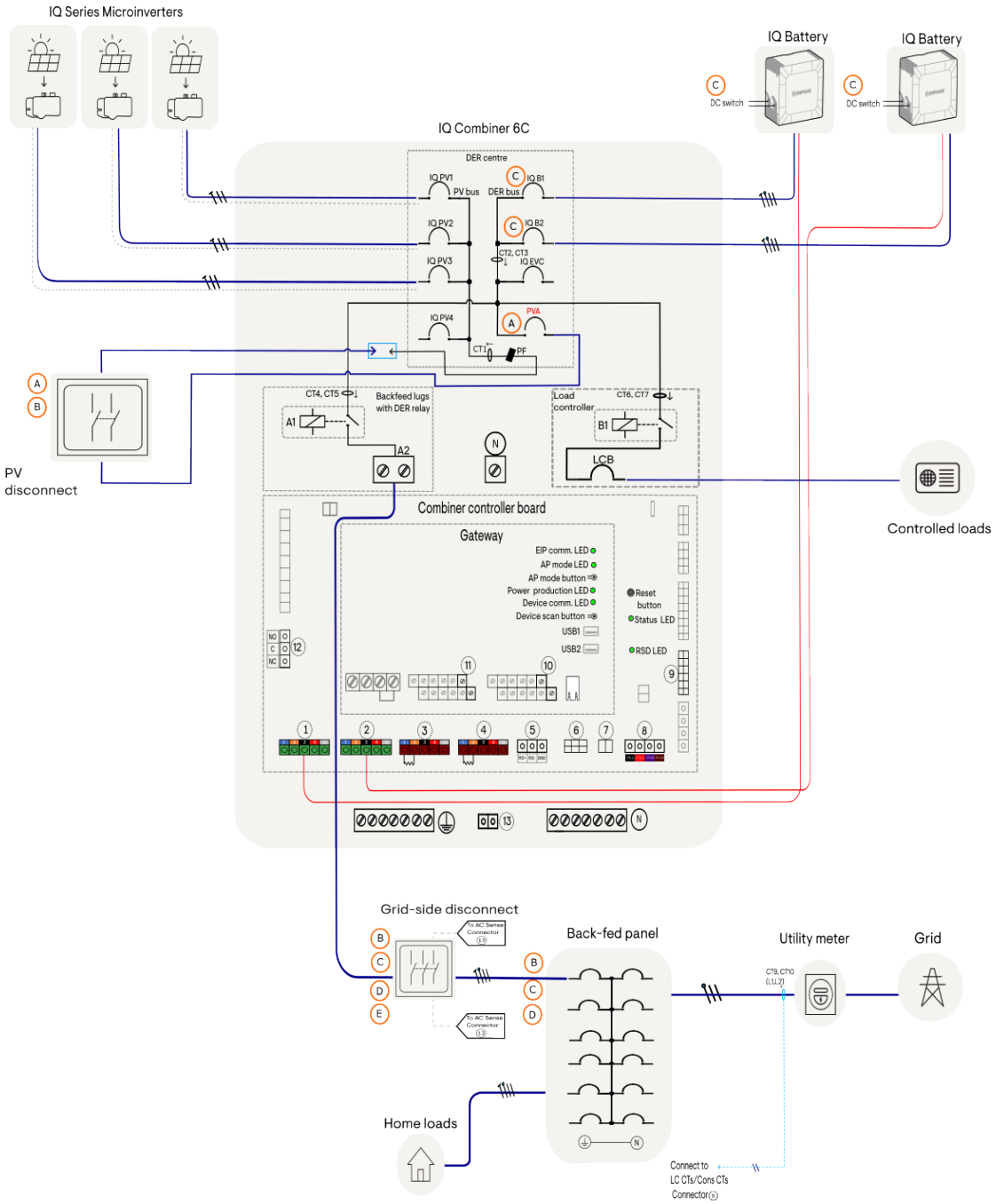

Figure 15: Grid-tied system initiators and disconnects

NOTE: PV disconnect in the figure above is inline with the PV Aggregate breaker in IQ Combiner 6C.

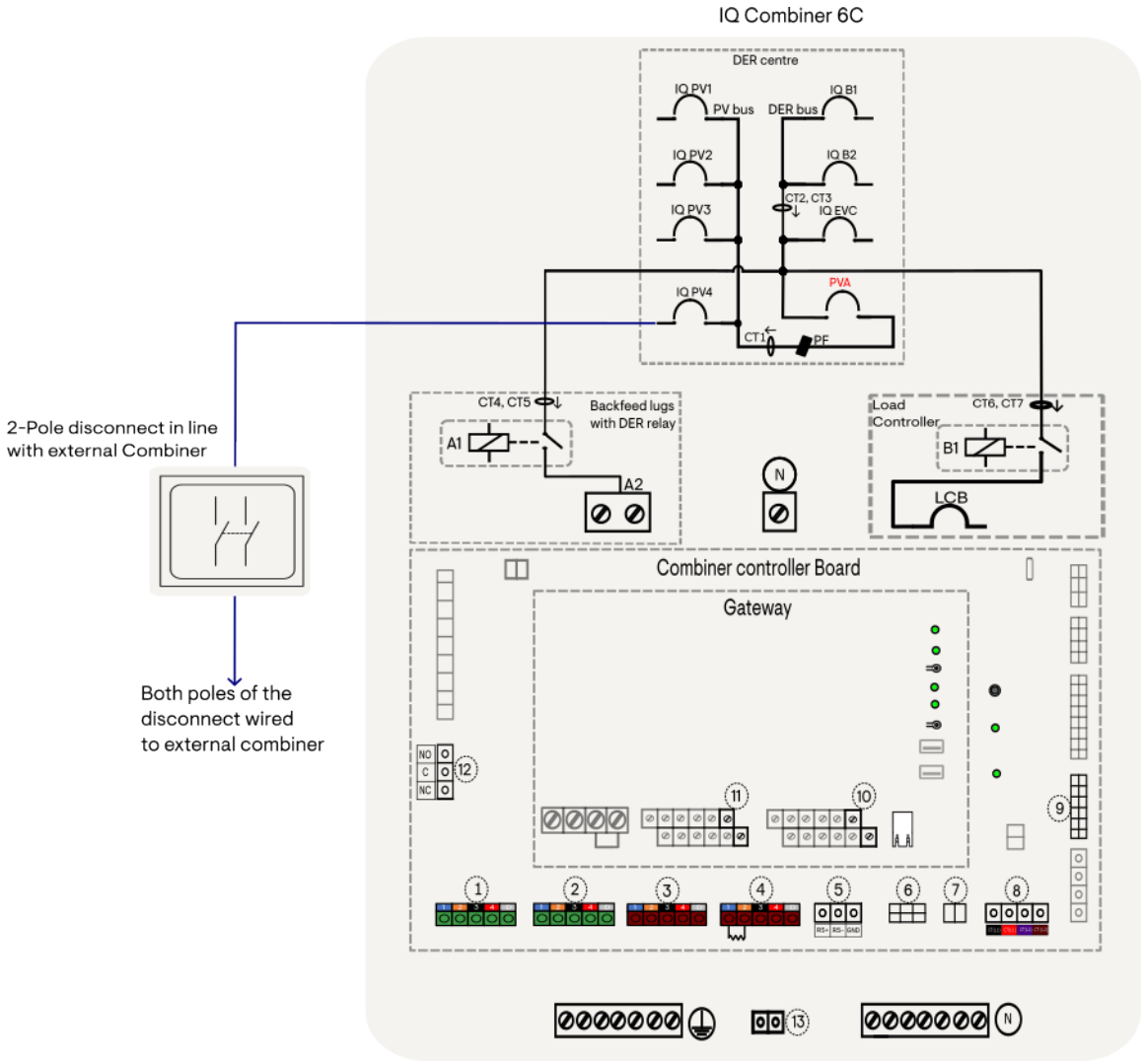

Figure 16: PV disconnect in line with external combiner (2-pole)

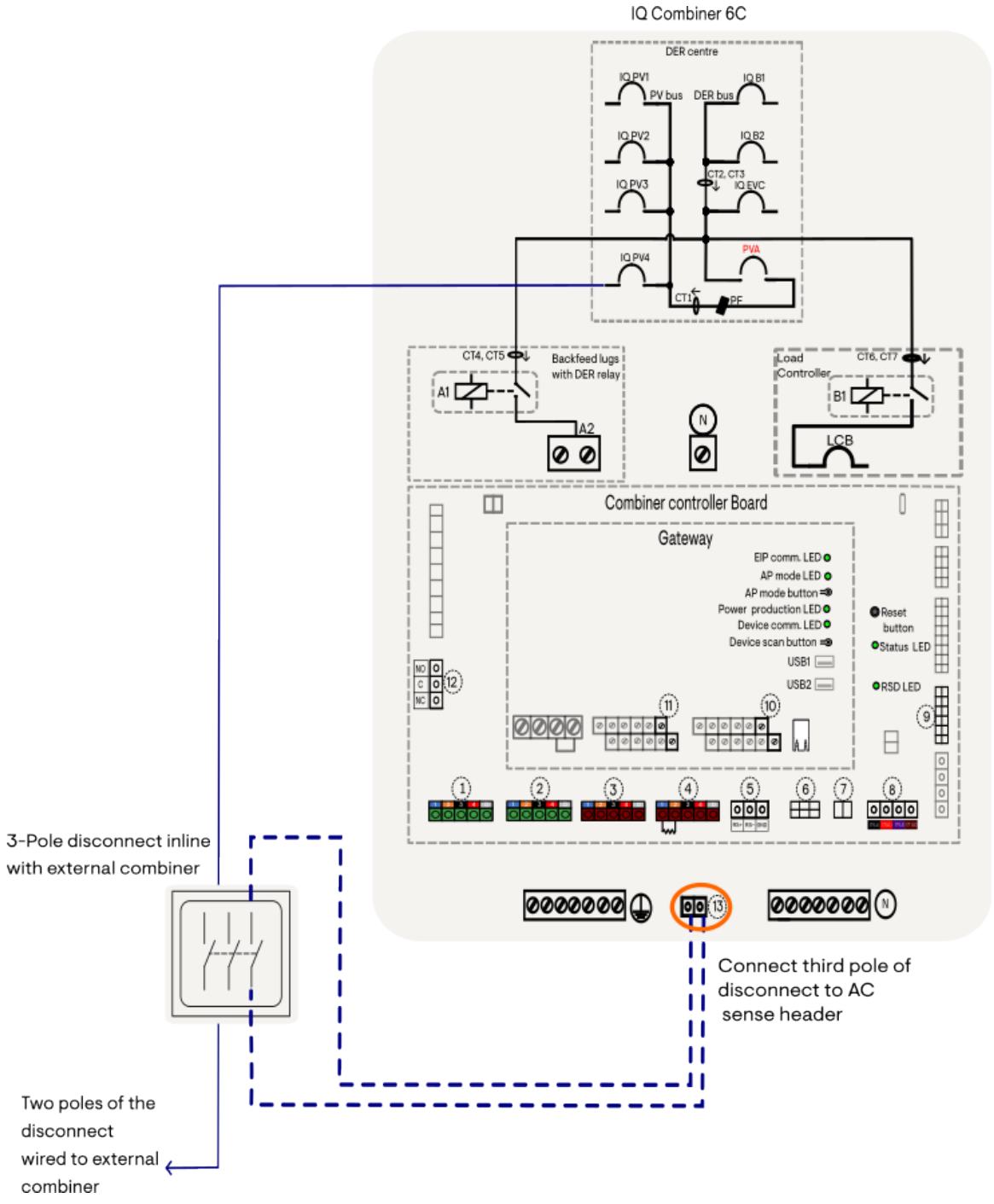

Figure 17: PV disconnect in line with external combiner (3-pole)

Initiators for various NEC or Utility requirement	In IQ Combiner 6C		In IQ Battery 10C	In the main panel	External disconnects			
	PV aggregate breaker	Battery breakers	Battery switches	Back-fed breaker	3-pole, grid-side disconnect	2-pole PV disconnect in line with PV aggregate breaker	2-pole PV disconnect in line with external combiner	3-pole PV disconnect in line with external combiner
PV Rapid Shutdown (2023 NEC 690.12)	Y	N	N	Y[6]	Y	Y	Y	Y
ESS Emergency Shutdown (2023 NEC 706.15B)	Y	Y	Y	Y[6]	Y	Y	N	Y
PV System disconnecting means (2023 NEC 690.13)	Y	N	N	Y[6]	Y	Y	Y	Y
ESS disconnecting means (2023 NEC 706.15)	N	Y	Y	N	Y	N	N	N
Visible break for the DER system (Only if required by AHJ or utility)	N	N	N	N	Y	N	N	N

[6] Only for grid-tied or grid-interactive, that is, backup-ready systems without IQ Meter Collar.

For notations, see Legend on page 31.

NOTE: Check the local and national codes and standards to determine whether the initiators and disconnecting means can be used at a particular site as recommended. The suitability may vary depending on the equipment location and other site-specific factors.

13. Supply-side connection

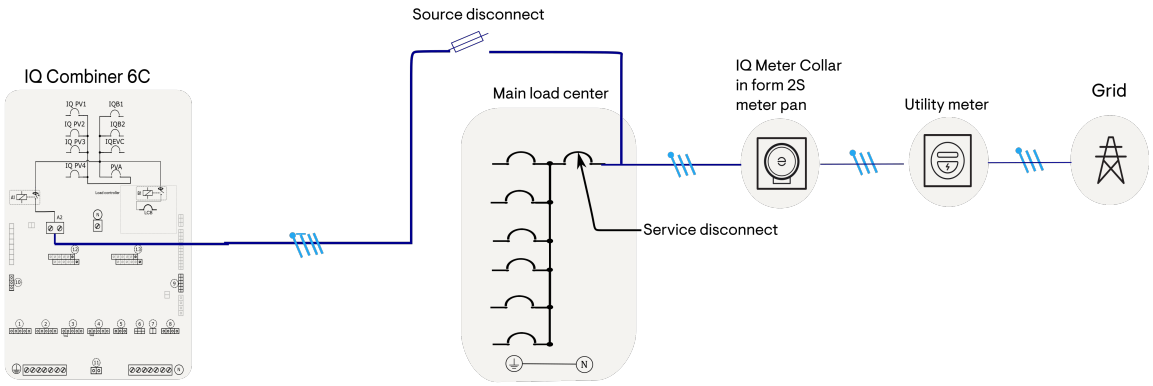

Figure 18: Supply-side connection

For notations, see Legend on page 31.

- The IQ Meter Collar and IQ Combiner 6C can be connected as supply-side equipment when properly installed:
  - IQ Meter Collar is labeled as service entrance rated, not service equipment.
  - Source disconnect and overcurrent protection for IQ Combiner 6C must be service entrance rated.
  - Grounded and bonded in compliance with NEC Article 250.
  - ESS charging may need to comply with NEC Article 750.30 to ensure no overload occurs.
- Where load control or Electric Vehicle Supply Equipment (EVSE) is connected, the IQ Combiner 6C no longer constitutes a pure supply-side connection. In such cases:
  - The source disconnect is classified as an additional service disconnect handle.
  - Grouping of disconnects must comply with NEC 230.71 and 230.72.
  - Service load calculations according to NEC 230.90 must be updated accordingly.

See Power Control Systems (PCS) on page 7 for details on supported PCS configurations.

Appendix A

Abbreviations

Abbreviation	Description
DER	Distributed energy resource
EES	Enphase Energy System
kW	Kilowatt
kVA	Kilovolt-ampere
MID	Microgrid interconnect device
NEC	National Electric Code
NFT	Neutral forming transformer
OCPD	Overcurrent protection device
PV	Photo voltaic
RSD	Rapid shutdown device
RDE	Rapid shutdown equipment
SKU	Stock keeping unit

Appendix B

Legend

Symbols	Description
	Equipment ground conductor
	Grounded conductor (Neutral)
	Ungrounded conductor
	Field-wired conductors
	Neutral sense
	Phase detection
	Relay
	Breaker

Connectors	Description
1	IQ Battery control header – 1
2	IQ Battery control header – 2
3	IQ Collar control header
4	Spare control header (not to be used)
5	RS485
6	Ride-through (RT) power supply accessory
7	Rope CT – power supply
8	Integrated load monitoring CT/External Consumption CT connector
9	Load relay connector (accessory)
10	NO/NC dry contact relay
11	AC sense
12	EVSE CT

Connectors	Description
13	NO dry contact relay
14	Battery power terminal
15	Battery control terminal
16	Battery control terminal with termination resistor

Label	Description
A1	DER relay
A2	Backfeed lugs
B1	Load control relay
B2	Up to 1 × 80 A load control breaker
CT1	Integrated revenue-grade PV CT (L2)
CT2,CT3	Integrated revenue-grade battery CTs (L1, L2)
CT4,CT5	Integrated backfeed CTs (L1, L2)
CT6,CT7	Integrated load control CTs (L1, L2)
CT8	Field-installed EVSE CT (L2)
CT9, CT10	Field-installed Consumption CTs (L1, L2)
IQ PV1, IQ PV2, IQ PV3, IQ PV4	Up to 4 × 20 A for PV strings or up to 3 × 20 A breaker and 1 × 20/20 A quad breaker
IQB1, IQB2	Up to 2 × 80 A for IQ Battery breaker
IQEVC	Up to 1 × 60 A for 1 × IQ EV Charger breaker
LCB	Up to 1 × 80 A for load control on non-backup loads
PF	PLC ferrite at PV aggregate (L2)
PVA	Pre-installed 60 A PV aggregate breaker as rapid shutdown initiator (RSD); can be replaced by 80 A, 100 A breakers

Appendix C

Planned configurations (not supported at launch)

Partial home backup configuration (planned configuration)

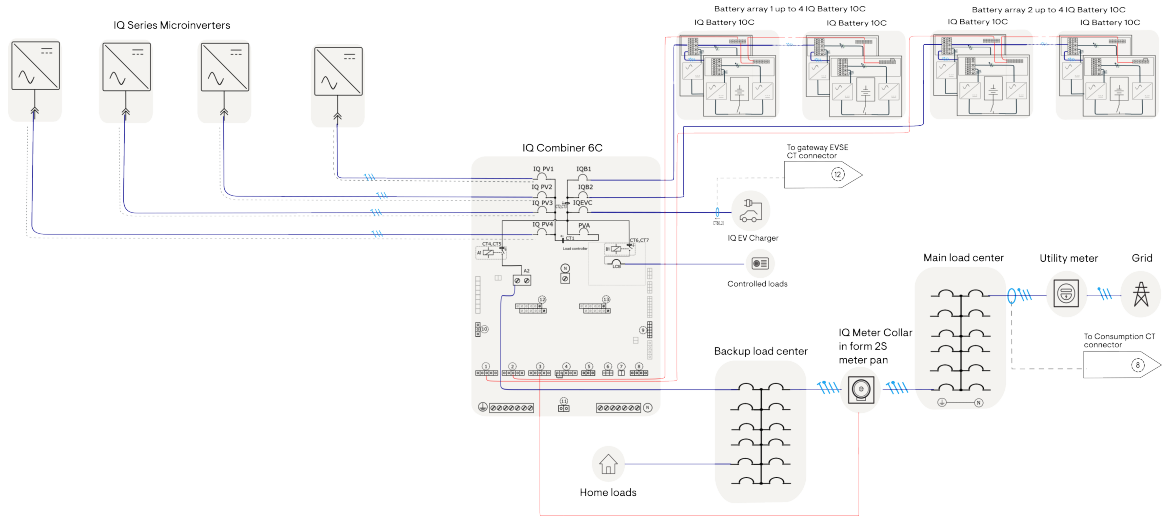

Figure 19: Partial home backup configuration

For notations, see Legend on page 31.

NOTE: This configuration is not supported now. It will be enabled in the future through a software update and may require a software upgrade during commissioning.

- For full home energy monitoring, the external Consumption CT must be connected to the Consumption CT connector in IQ Combiner 6C.
- The IQ Combiner 6C includes an integrated load controller with built-in CTs, which can connect legacy microinverters or third-party PV systems.

400 A supply #3

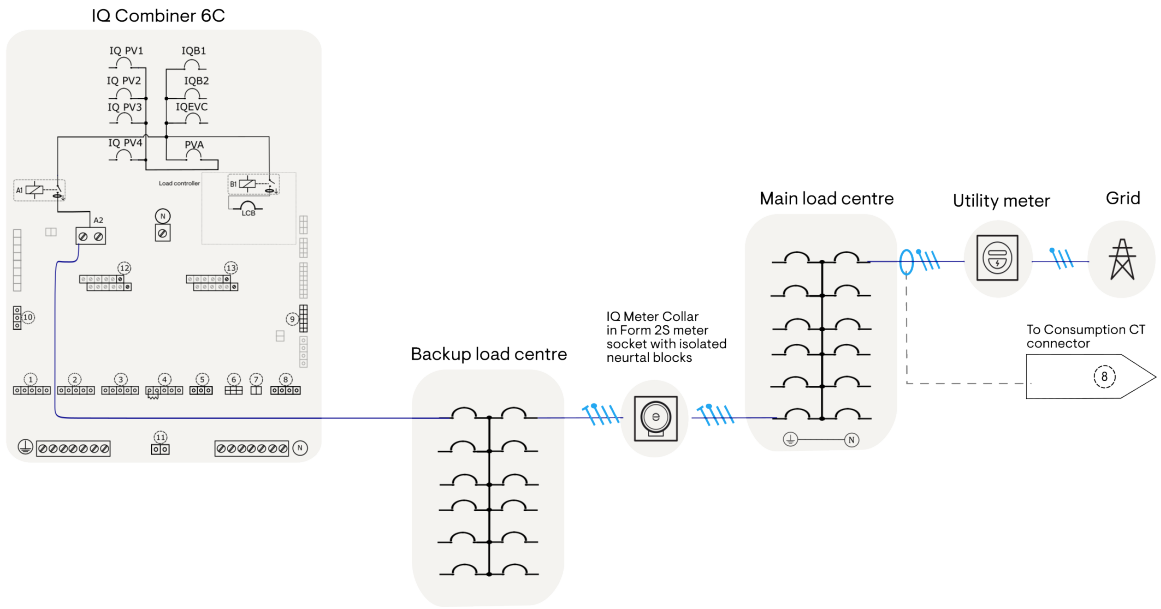

Figure 20: 400 A supply #3 - partial home backup with a single backup system

- A panel with an isolated neutral and a ground connection to the panel chassis/body is required. Alternatively, if the neutral is passed through (i.e., not terminated on the panel), the ground must still be connected to the chassis/body.

For notations, see Legend on page 31.

Legacy and third-party PV support (planned configuration)

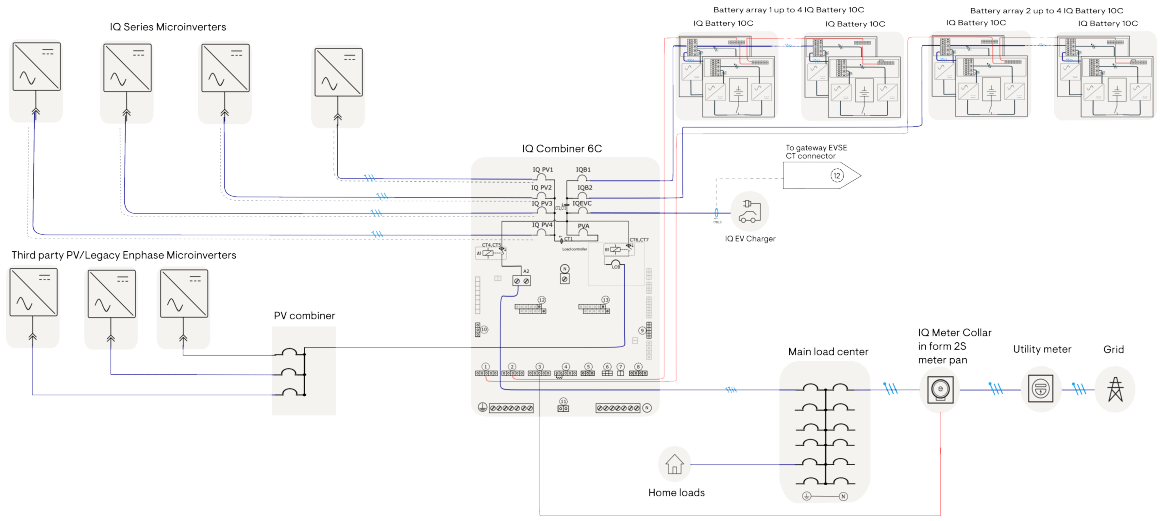

Figure 21: Legacy and third-party PV support

For notations, see Legend on page 31.

NOTE: This configuration is not supported now. It will be enabled in the future through a software update and may require a software upgrade during commissioning.

- Legacy Enphase/third-party PV is integrated using the integrated load controller.
- Load shedding is not supported in systems that integrate legacy Enphase microinverters or third-party PV.
- The system will shed the Legacy Enphase/third-party PV when the system transitions to off-grid.
- The IQ Meter Collar can be installed under the meter, provided the utility permits its placement within the same meter pan, below the utility meter.

NEM expansion grid-forming configuration (planned configuration)

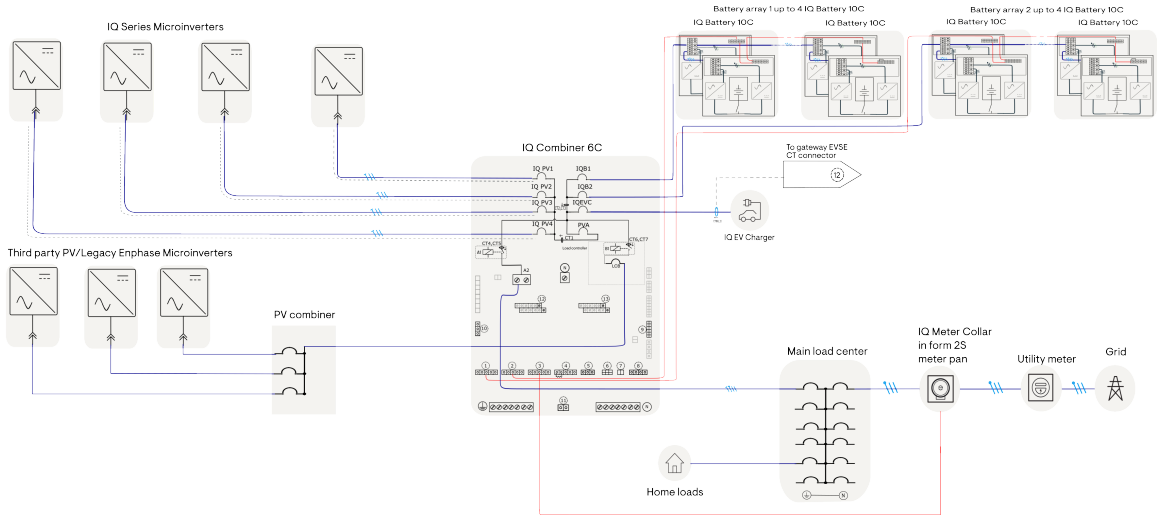

Figure 22: NEM expansion grid-forming configuration #1

For notations, see Legend on page 31.

NOTE: This configuration is not supported now. It will be enabled in the future through a software update and may require a software upgrade during commissioning.

- The system will disconnect the third-party/legacy Enphase PV microinverters when the system is off-grid.
- Legacy Enphase/third-party PV is integrated using the integrated load controller.
- There is no need to install additional CTs to measure the production of third-party or legacy Enphase PV systems. The built-in load CTs in the integrated load controller will measure the production and use it to implement NEM integrity mode.
- If the legacy Enphase system uses an IQ Gateway, a power line filter to isolate the systems is required.
- Load shedding is not supported in systems that integrate legacy Enphase microinverters or third-party PV.
- The IQ Meter Collar can be installed under the meter, provided the utility permits its placement within the same meter pan, below the utility meter.

NEM expansion grid-tied configuration (planned configuration)

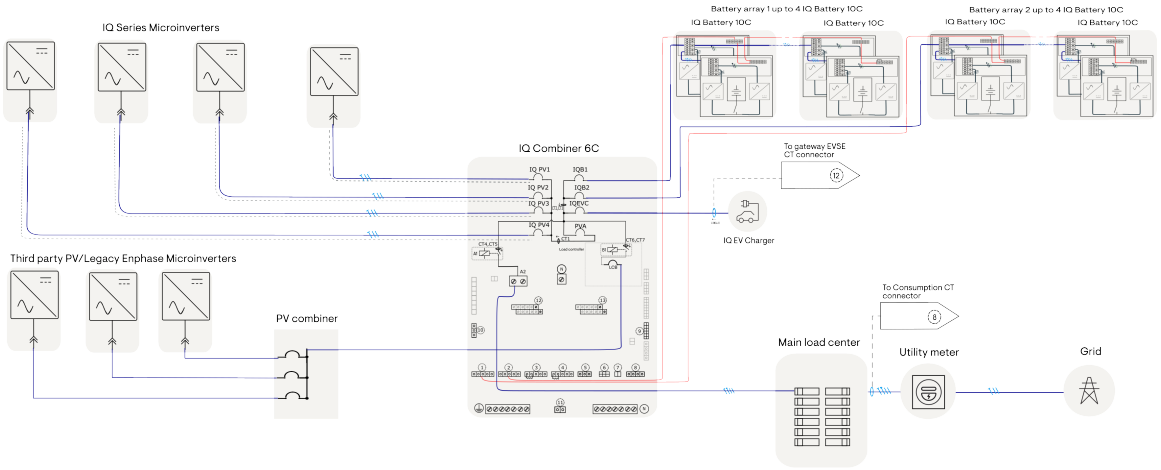

Figure 23: NEM expansion grid-tied configuration

For notations, see Legend on page 31.

- To ensure proper functionality, the external Consumption CT and the integrated load/PV CT from the integrated load controller should be connected in parallel to the Consumption CT connector.
- Configuration without the IQ Battery is supported, allowing IQ Series Microinverters alongside third-party or legacy Enphase microinverters.
- If the legacy Enphase system uses an IQ Gateway, a power line filter to isolate the systems is recommended.

17. Revision history

Revision	Date	Description
TEB-00282-1.0	June 2025	Initial release.